Benefits of Climate Adaptation on State of Good Repair Efforts

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Presentation Outline

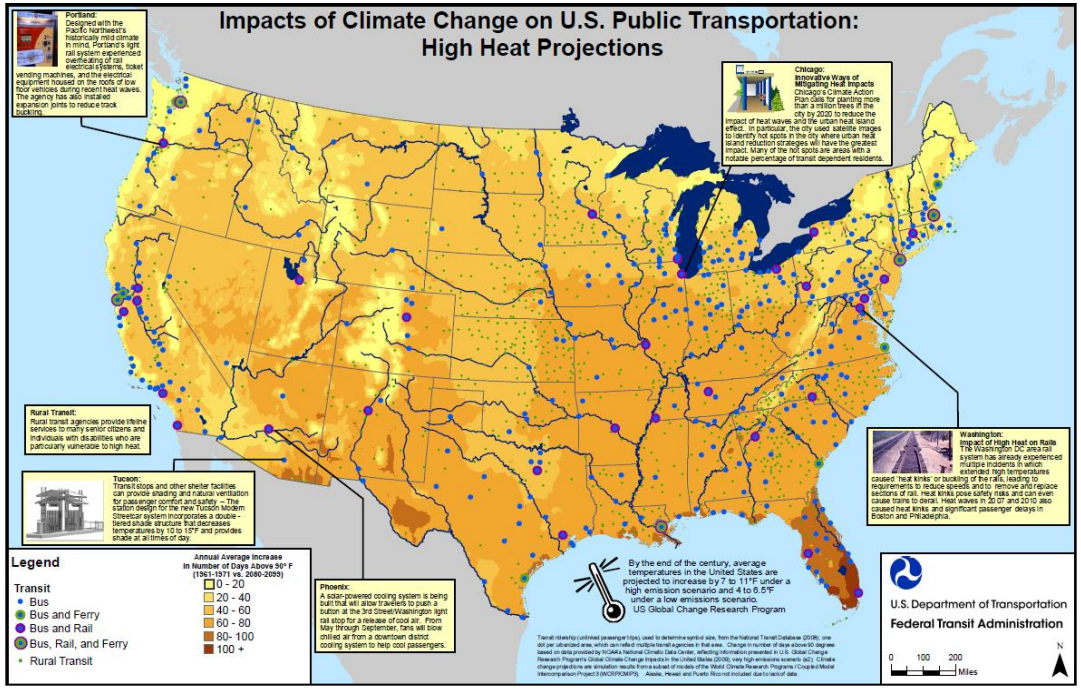
- **Impacts:** Extreme weather and climate change can significantly impact transit state of good repair.
- **Immediacy:** Climate change impacts on transit are already being experienced and will increase in the future.
- **Adaptation:** Some transit agencies are already taking initial steps. FTA is taking action to help the industry and protect the federal investment. Historic weather patterns are no longer a good guide to future weather patterns. We must plan for asset preservation under future conditions.

Source for climate information is USGCRP 2009 National Climate Assessment.

Heat Waves

Heat kink de-rails DC Metro train July 6, 2012.
55 passengers evacuated, severe delays, emergency track work performed, scheduled track work cancelled.

U.S. average temperature has risen more than 2°F over the past 50 years and heat waves have become more frequent and intense. By 2100, most areas of the country are projected to see an **additional 40-80 days** per year **over 90°F**.

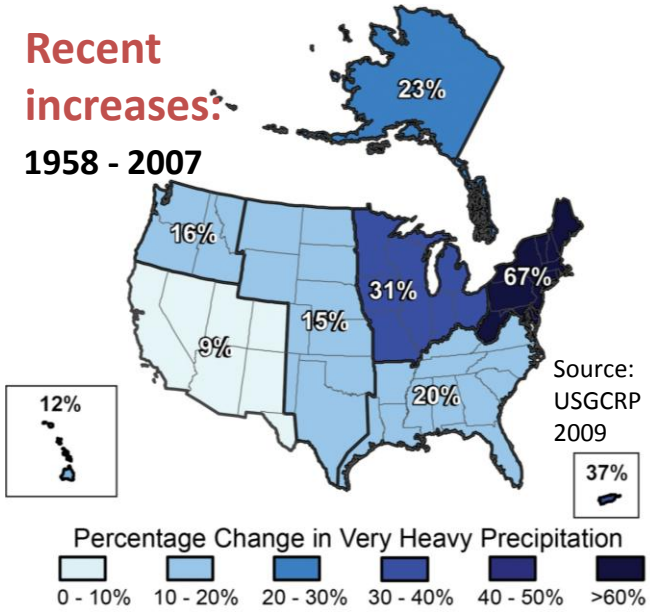


Heat Impacts on Transit: overheated electrical equipment, stretched catenary wires, over-heated vehicles, failed A/C, rail buckling, stressed materials, asset life reduction.

Heavy Rain & Snow

Recent increases:

1958 - 2007



Source: USGCRP 2009

Future increases:

100-yr floodplain width projected to increase 45% on average by 2100.

– FEMA commissioned study

Philadelphia

Nashville

Chicago

Houston

Hurricane Intensity

Trends

- Atlantic hurricane intensity increased in recent decades as sea surface temperatures increased 2°F.
- Trend projected to continue.

Recent Transit Hurricane Losses

New York MTA Irene Costs:

- $13.9 million lost revenue
- $7.7 million in prep. & response
- $50 million to repair Port Jervis line

SEPTA Costs:

- $2.2 million - Hurricane Irene
- $4.2 million - Tropical Storm Lee

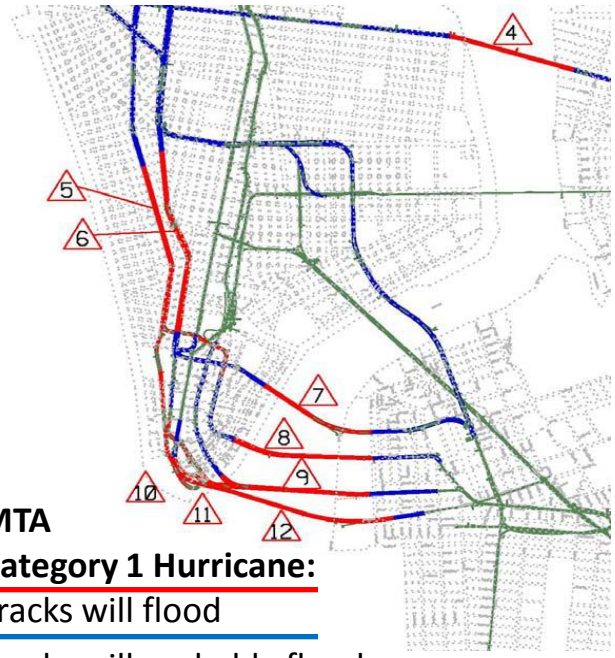
Island Transit (Galveston, TX)

- During Hurricane Ike lost 19 of 21 transit buses and 6 support vehicles, sustained damage to 4 trolleys and maintenance facility. $1.6 million.

Hurricane Katrina

- Massive damages to NORTA assets

MTA damage from Irene.



MTA Category 1 Hurricane:

Tracks will flood

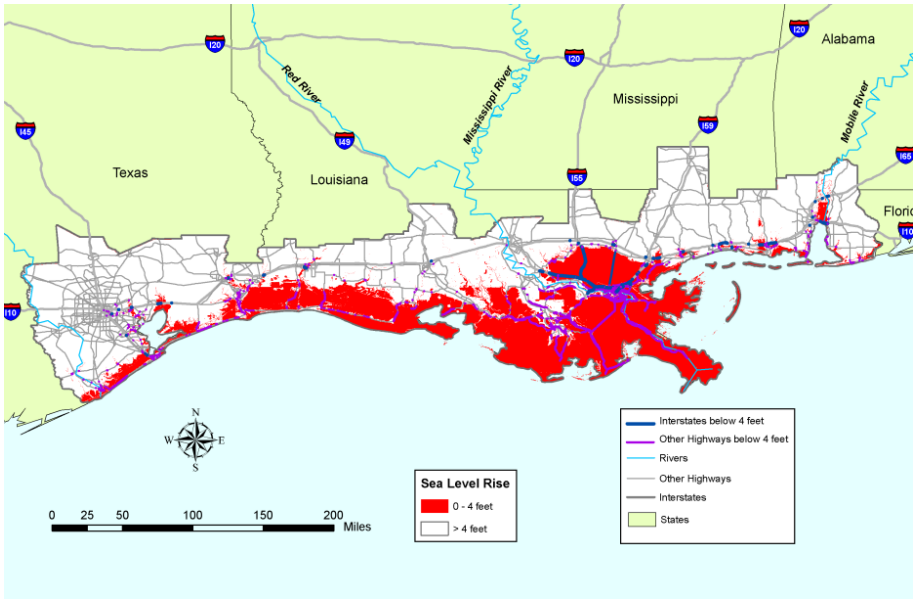
Tracks will probably flood

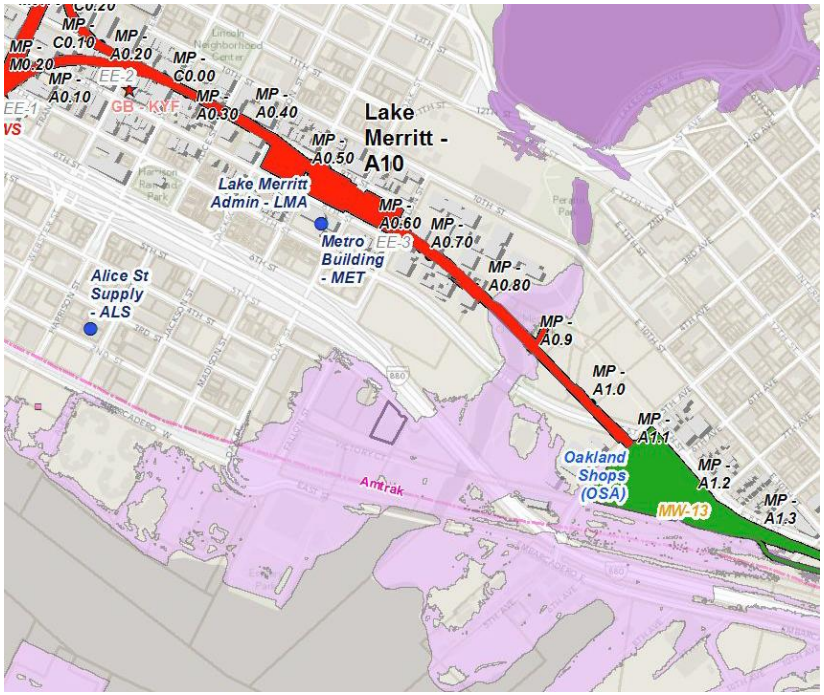
Potential for Large Losses:

Example: NYC subway tunnels will flood under Category 1 Hurricane. Luckily Irene weakened to tropical storm before hitting NYC.

Sea Level Rise

- Sea level projected to rise 3 to 4 feet by 2100.
- 10% of land in U.S. coastal municipalities lies below 3.3 feet. (Weis et. al. 2011)



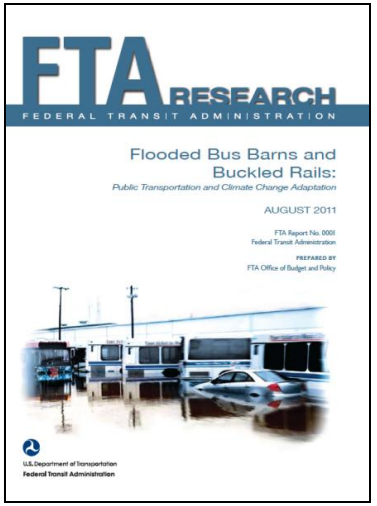


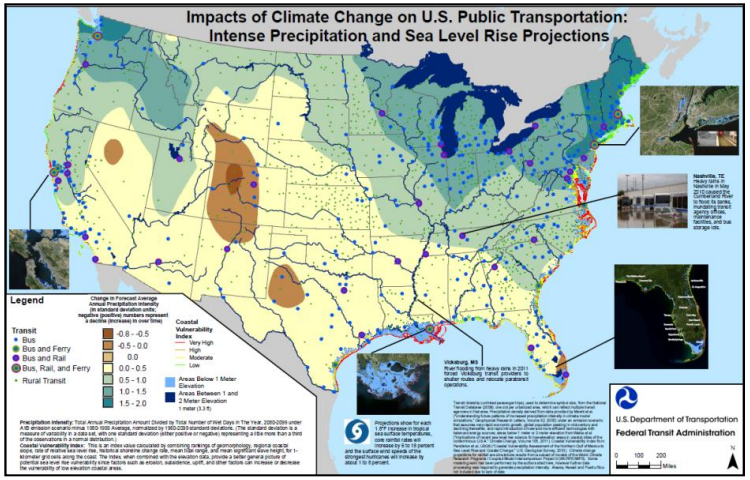
Left: Red indicates areas of central Gulf Coast region below 4 feet in elevation. Source: US DOT.
Above: Purple indicates area surrounding Lake Merritt BART station vulnerable to 55 inch sea level rise. Source: BART climate pilot.

FTA is Helping the Industry Protect the Federal Investment in Infrastructure

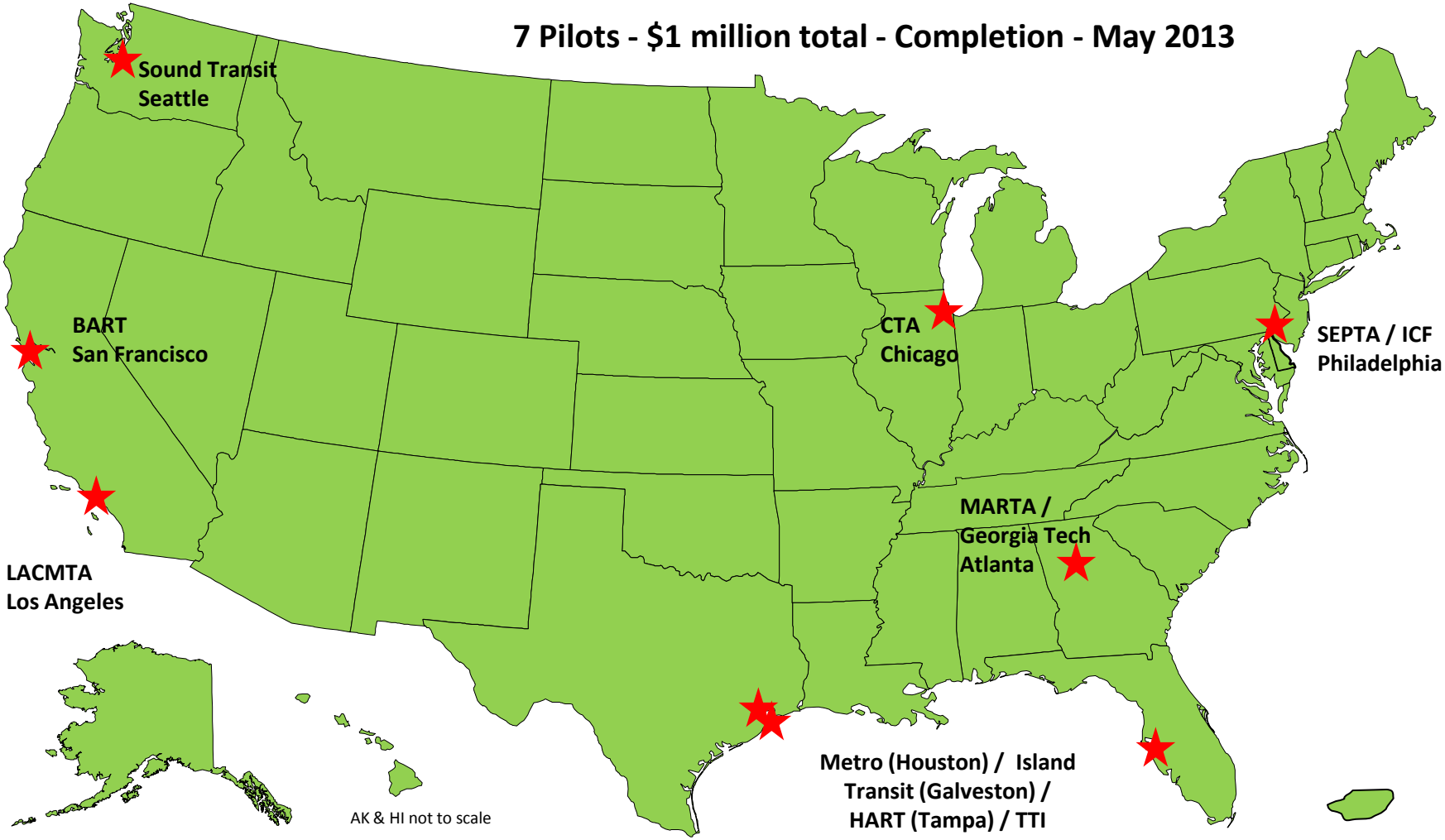
- **Policy Framing:** Dear Colleague Letter and Policy Statement describe climate impacts on FTA goals and commit FTA to action
- **Report:** Examines climate impacts, strategies, risk management tools
- **Outreach:** Workshops and webinars
- **Pilots:** Delve more in depth on climate impacts on particular transit agencies, potential adaptation strategies, mainstreaming into transit practices

www.fta.dot.gov/adaptation





FTA Funding 7 Climate Adaptation Pilots



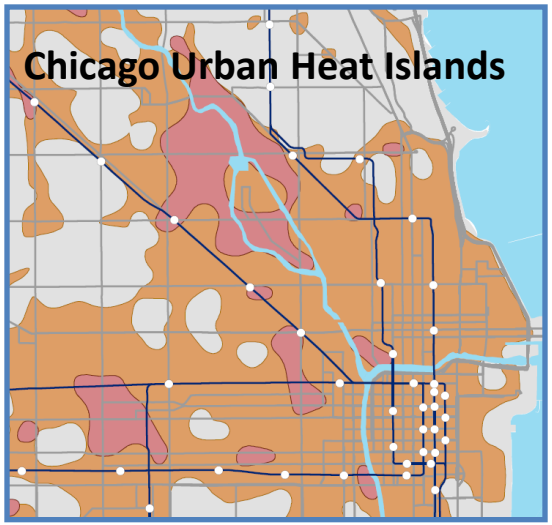
2 Pilots Focus on Asset Management

Georgia Tech / MARTA

Will identify how MARTA's enterprise asset management system could be used to monitor climate changes and help in identifying response strategies.

CTA

Will develop detailed analyses and implementation plans for three shovel-ready projects to improve resilience of CTA assets to climate impacts.

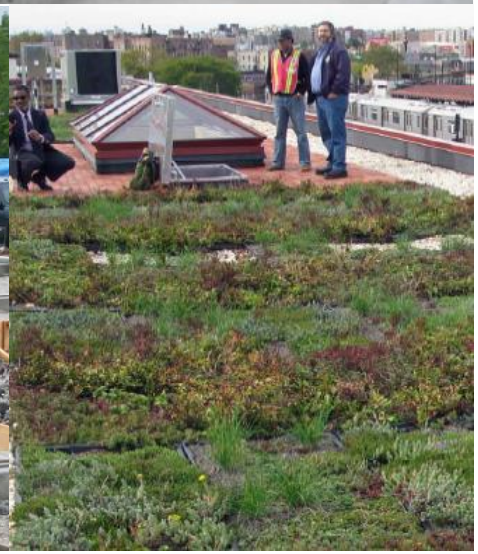


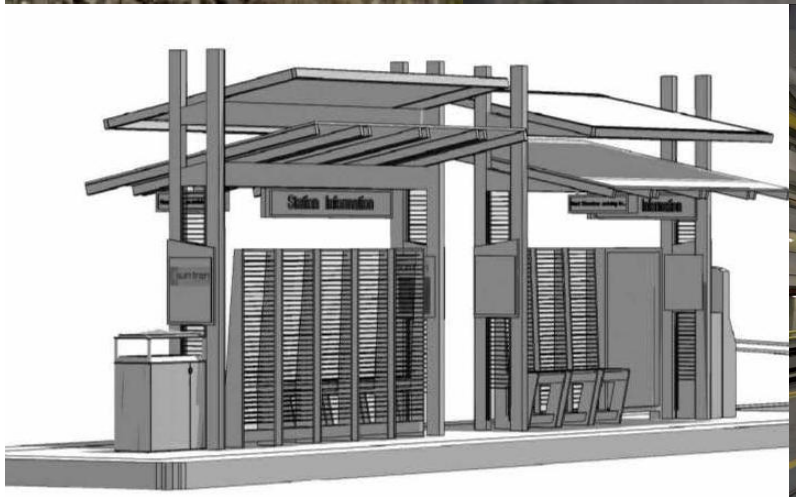
Pilot Findings To Date

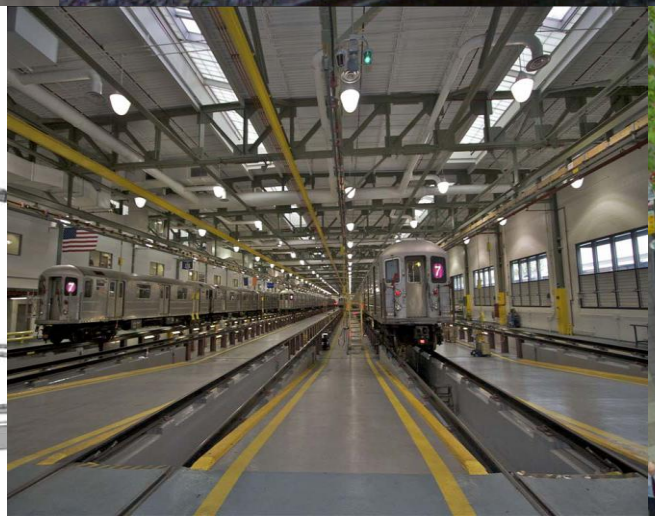
- Challenge: Costs for weather damages not systematically tracked (except for FEMA reimbursement data for disasters).
- Institutional knowledge on weather impacts exists and is key but needs to be gathered and analyzed. Important to connect with right people. Interviews and workshops are proving successful.
- Transit systems face a wide variety of impacts depending on region & type of assets. Non-coastal impacts also important.
- Systems with climates analogous to the future climate of other systems can provide insights.

Transit Agencies Are Taking Action!

Transit Agency	Adaptation Actions
New York MTA	1st report on climate change hazards at a US transit agency. Partnered with state and local adaptation efforts. Spent $157 million on flood mitigation, including $33.6 million to raise 19 station entrances, pave over 770 ventilation gratings, raise 813 ventilation gratings, install 14 mechanical devices.
Los Angeles MTA	Completed climate change vulnerability assessment of assets, 7/2012.
New Jersey Transit	Completed climate change vulnerability assessment of assets, 3/2012
Waves Transit, AL	Part of multi-modal US DOT Gulf Coast Study, Phase II
TriMet	Participating in regional adaptation efforts
Cape Cod Transit	Part of interagency climate change pilot, assessment of sea level rise impacts.
Honolulu Transit	Participated in FHWA adaptation pilot
King County Metro	Stakeholder in county adaptation efforts, which are at forefront of field
Transport for London	Adaptation included in risk and asset management systems. Adding air conditioning, addressing flooding to existing system. Climate impacts incorporated into design of major project – "Crossrail."
Istanbul	New rail link built for 3 ft sea level rise + 1 in 10,000 yr flood
Taipei	After typhoon dumped 50 inches of rain in two days, set new standards for entrances: 2-4' above ground + 6" above 100 yr flood, tunnel floodgates





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Benefits of Climate Adaptation on State of Good Repair Efforts

- **Avoids** catastrophic premature **failure** of assets
- **Protects** critical assets and services
- **Saves money** – hazard mitigation costs less than damage caused from inaction
- Responsibly **manages risks**
- Asset management systems offer a **streamlined** and systematic framework for addressing climate risks. avoiding extra work of separate processes.
- **Bottom Line: Historic weather patterns are no longer a good guide to future weather patterns.** Therefore, agencies should plan for system preservation and safe operation under current and anticipated conditions.